DOCUMENT RESUME

ED 464 075 SP 040 684

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TITLE Instructional Environments and Learning: Exploring Knowledge Growth in Preservice Family and Consumer Sciences Education.

PUB DATE 2002-04-00

NOTE 29p.; Paper presented at the Annual Meeting of the American Educational Research Association (New Orleans, LA, April 6-10, 2002).

PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.

DESCRIPTORS *Classroom Environment; *Concept Mapping; Constructivism (Learning); *Consumer Education; *Consumer Science; Elementary Secondary Education; Higher Education; Preservice Teacher Education; Prior Learning; Student Teachers; Teaching Methods

IDENTIFIERS *Family and Consumer Sciences; Knowledge Development

ABSTRACT

This study examined what 16 female family and consumer sciences (FCS) preservice teachers learned given 1 instructional environment. Participants were enrolled in three FCS teaching methods and curriculum courses. A 2-hour lesson on classroom management using small group theory was selected. On the first day of class, participants completed questionnaires that examined their background knowledge. They constructed unprompted and prompted concept maps of their understanding of the lesson topic. Two weeks later, the instructor taught the lesson. Researchers made videotapes and field notes about the instructional environment. At the end of the lesson, candidates again constructed unprompted and prompted concept maps. Maps were scored and analyzed. Candidates completed questionnaires about concepts they had learned and instructional features that helped them learn. They compared their maps and wrote about how their knowledge changed following the instruction. Four candidates completed stimulated recall sessions. Candidates completed a brief assessment 6 weeks later to measure their learning. Candidates' knowledge construction was greatly influenced by stories or cases about which they had much prior knowledge. Experiential learning and multiple opportunities for elaboration on the social plane were important influences on learning. The instructional approach allowed the instructor to access and address students' concerns or goals. (Contains 17 references.) (SM)

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Instructional Environments and Learning: Exploring Knowledge Growth in Preservice Family and Consumer Sciences Education

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Paper presented at the annual meeting of the American Educational Research Association,

April, 2002, New Orleans, LA

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Instructional Environments and Learning: Exploring Knowledge Growth in Preservice Family and Consumer Sciences Education

Introduction

As teacher educators in family and consumer sciences (FCS), the two of us endeavor to build on our students' prior knowledge, and restructure their counterproductive conceptions of teaching and learning. Our efforts are tied to a passionate commitment to the profession's mission of empowering individuals and strengthening family life. Specifically, we want our preservice teachers' thinking to lead them to use student-centered, democratic practices that enable students in secondary schools to construct deep, conceptual understandings of FCS subject matter. If the beginners we instruct can learn to teach in such a manner, their students will have the knowledge and skills to solve problems and make decisions in everyday life based on their present circumstances.

This study was prompted by our need to know what changes occur in FCS preservice teachers' thinking when various instructional approaches are used during teacher education. In examining the literature, we found that few such studies have been conducted in FCS education. Knowing that teacher educators in all disciplines have similar concerns, we broadened our literature search to look across teacher education. The review included a best-evidence synthesis of 43 studies that examine the influence of teacher education course work on preservice teachers' conceptions and practices. Taken together, 9 studies reported limited change, 32 studies reported meaningful change, and 2 studies reported mixed results (see Jensen, 2001 for a complete discussion of this review).

Several clear conclusions emerged from the literature search. The most important

conclusion is that teacher candidates learn a great deal during teacher education. Although the degree of change varies among them, many of the students conceptions of teaching and learning change in accordance with the knowledge base during teacher education. This conclusion is in direct opposition to the notion put forth by various socialization and life history researchers that teacher education is simply not powerful enough to restructure teacher candidates' conceptions. Several studies within the review, and a handful of others that scholars all too often cite in the literature, (e.g., Bullough, Knowles, & Crow, 1992; Crow, 1987; Knowles, 1992; Lortie, 1975; Zeichner & Gore, 1990; Zeichner & Liston, 1987; Zeichner, Tabachnick & Densmore, 1987) echo this dismal conclusion. Absent from much of this literature, nevertheless, is a careful scrutiny of the instructional approaches utilized with candidates.

Although researchers used a surprising number of instructional approaches in the studies reviewed, the instruction preservice teachers received clearly made a difference in what they learned. Still, that prior knowledge makes a difference in what candidates learn is also an important conclusion that must not be dismissed. Teacher candidates who receive the same instruction do exhibit varying degrees of change due to differences in their prior knowledge.

Among the 32 studies that report meaningful change, researchers made a plethora of claims concerning the instructional strategies that prompted change. However, less than one-third of these studies provided sufficient evidence to support these claims. Sufficient evidence has not yet accumulated concerning what candidates learn given various instructional environments. Further, evidence is lacking to determine if the content of what candidates learn affects their learning.

Constructivist theorists suggest that learning is more likely when instruction involves

"more student-centered, active learning experiences, more student-student and student-teacher interaction, and more work with concrete materials and in solving realistic problems" (Winitzky & Kauchak, 1997, p. 62). Although useful, these notions of constructivist teaching are too broad for immediate application in teacher education. Further, these are untested assertions. Until teacher educators know more about what preservice teachers learn in various instructional environments, constructivism will remain, at best, a learning theory with limited ability to inform teaching (see Figure 1).

The purpose of this study was to extend constructivist learning theory to practical applications for teaching by closely investigating teaching and learning in FCS teacher education. Specifically, the aim of this study was to determine what candidates learn given one instructional environment. Research questions for this exploratory, mixed design study include:

1. What prior knowledge did teacher candidates have before instruction?
2. What were the instructor's goals?
3. What instructional strategies were present in the lesson?
4. What did teacher candidates learn from instruction?
5. What relationships, if any, existed among the first four questions?

Method

Sixteen female FCS teacher candidates participated in the study. Candidates were enrolled in an integrated sequence of three FCS teaching methods and curriculum courses. They took these courses the semester before beginning their student teaching in secondary schools. Participants attended a large, private university operated by a religious organization in the Rocky Mountains. A demographic questionnaire revealed that one-fourth of the sample were married;

fifteen candidates were Anglo American and one was Hispanic; ten candidates were fluent in a language other than English. Their mean age was 24.

Dr. Adams, the instructor who participated in the study, was an Anglo American female in her late-50's. She was an associate professor and teacher educator in the School of Family Life, and had worked in her present position since 1980. She team-taught the three courses with two faculty members from secondary education, and has taught these courses with one of them for the last decade.

From descriptions of six lessons supplied by the instructor, a 2-hour lesson on classroom management using small group theory was selected. The lesson was chosen based on its ties to constructivist pedagogy, and claims about the instructional strategies that had prompted change within the 32 studies mentioned previously. To determine what Dr. Adams' goals were, two measures of her thinking included an interview and concept mapping. To condense these data, a summary containing the major ideas was written, and Dr. Adams read the summary to ensure that it accurately depicted her thinking.

On the first day of class, participants completed a demographic questionnaire that provided an indication of their background knowledge. Descriptive statistics were used to analyze these data. Teacher candidates also constructed an unprompted and prompted concept map of their understanding of the lesson topic. An assumption of concept mapping is that concepts are organized hierarchically in memory. A concept map provides, therefore, a visual representation of each candidate's thinking.

The procedure for having participants construct concept maps was adapted from Eggen, Kauchak, Winitzky, Jensen, and Hadden (1997), Roehler, Duffy, Conley, Herrmann, Johnson, and

Michelsen (1990), and Winitzky, Kauchak, and Kelly (1994). Participants first observed a three-part procedure and received prototype maps from other content areas. Candidates then constructed an unprompted map for the topic "classroom management." They individually brainstormed a list of terms related to the topic to activate prior knowledge, and organized the terms into a concept map depicting the relationships between concepts. After constructing the map, participants each described in writing the reason for organizing concepts and they did and specified relationships among them. Candidates turned in these maps to the principal researcher.

To construct a prompted map, candidates received an alphabetized list of terms generated from the instructor's map. They constructed another map using as many terms as they liked, and were told that they could integrate additional items not on the list. Again, teacher candidates wrote a description to explain their reasons for organizing concepts as they did and to specify relationships among them.

Then 2 weeks into the semester, the instructor taught the lesson. A video camera and field notes were the means used to gather naturalistic data about the instructional environment. Analysis of these data focused on identifying major instructional events, which were then used to construct a narrative description. Dr. Adams read the description to insure its accuracy and increase validity. Further, the amount of time spent on each concept was documented by tallying frequency counts for concepts covered during each 3-minute lesson segment. We accomplished inter-rater agreement for this tally through individual tallies. The two of us discussed the few discrepancies in coding the transcript until reaching full agreement.

At the end of the lesson, candidates constructed an unprompted and prompted concept map as was done on the first day of class. Analysis procedures from Roehler, Duffy, Conley,

Herrmann, Johnson, and Michelsen (1990) with one modification suggested by Winitzky, Kauchak, and Kelly (1994) were used to score unprompted and prompted maps. Maps were scored for: (a) the number of individual concepts, (b) the number of chunks, e.g., groups of superordinate concepts with two or more subordinate concepts, and (c) a hierarchical structure score, e.g., the sum of the number of horizontal chunks at the widest level and the number of vertical levels (Eggen et al., 1997). Validity and reliability for concepts maps are well established (see Eggen et al., 1997; Michelsen, 1987; Naveh-Benjamin & Lin, 1994; Roehler et al., 1990; Winitzky et al., 1994). Both intra-rater and inter-rater reliability checks were conducted in the present study. Intra-rater reliability was computed at 100%. Further, the lead author and a teacher thinking expert individually scored a random sample of maps followed by negotiation. Discussion occurred until there was complete inter-rater agreement.

After scoring all maps, they were examined both quantitatively for structural complexity and qualitatively for content. Quantitatively, comparisons were made between pre- and post-maps for changes in the number of unprompted concepts, prompted concepts, chunks, and for changes in hierarchical structure. Qualitatively, comparisons were made between pre- and post-maps for: (a) the presence of target concepts (i.e., those from the instructor's map), (b) the use of target concepts under both post unprompted and prompted conditions, (c) the prominence of specific target concepts, and (d) the durability of candidates' non-target concepts from pre- to post-mapping (Eggen et al., 1997).

In addition to constructing post unprompted and prompted maps, candidates responded to a learning questionnaire. The questionnaire had candidates identify in writing (a) the most important concept(s) they had learned, (b) the features of instruction that helped them to learn

each concept, and (c) why these aspects of instruction helped them to learn the concept(s). Findings reported here are related to candidates' responses to the first query. Codes for these data included the 28 target concepts from Dr. Adam's map. To ensure reliability, the two of us independently coded the data followed by discussion until reaching full agreement concerning the few instances in which the same code(s) had not been applied.

Finally, candidates compared their unprompted pre- and post-maps and wrote a paragraph indicating how their knowledge changed as a result of the instruction. While these postdata were being collected from candidates, the instructor also identified the concepts on her map that she felt were most and least emphasized during the instruction.

On two days following the classroom management lesson, four candidates selected at random participated in two stimulated recall sessions, one on each day. A decision was made to limit the number of candidates interviewed and conduct an indepth analysis. Either the first author or a research assistant viewed a videotape of the instruction with each participant using a videocassette recorder (VCR) and a television monitor.

Note that the procedure used to conduct stimulated recall interviews is new to this study. Rather than show candidates video episodes that researchers or the instructor recognized as critical incidents, each student was instructed to stop the videotape in places where the instruction best aided her learning. At these points, each candidate identified the instructional strategy that helped her to learn, why the strategy was helpful, and what she learned. Reported here are findings related to the latter query.

The 28 target concepts from the instructor's map were used as codes, in addition to one termed "incidental learning." After the first author coded candidates' responses twice to ensure

reliability, the second author independently coded the data. Discussion occurred until reaching full agreement concerning all instances where we had not applied the same code(s). Also as part of the stimulated recall interviews, candidates answered questions to assess their beliefs about teaching and learning generally. Each stimulated recall session was audiotaped.

Finally, candidates completed a short answer assessment 6 weeks after the lesson. The assessment questions provided a distal measure of candidates' learning. That is, the questions furnished a means of determining if candidates had processed the content into long-term memory. Rating scales were used to analyze candidates' responses. They were developed using guidelines specified by Stiggins (1997) for scoring open response formats. After the first author scored candidates' responses on two separate occasions, the second author independently scored candidates' responses. To resolve the few discrepancies in scoring, discussion ensued until we reached full agreement.

Findings

Data from both the demographic questionnaire and the preconcept mapping confirm that candidates were indeed beginners at teaching. Demographic data revealed that candidates had taken a limited number of education courses. They had, on average, a few prior teaching experiences in various settings. Nevertheless, few of these settings emphasized research-based notions about teaching and learning. Likewise, preconcept map data suggested that candidates recognized a number of target concepts, but could not recall them without being prompted. The candidate's preunprompted concept map in Figure 2, for example, contains few concepts listed on the instructor's concept map.

Analysis of the interview with the instructor and her concept map of the lesson topic

revealed that the instructor's goals focused on teaching candidates to use small groups as a means of organizing students to manage various aspects of classroom life (see Figure 3). These include: (a) elements in the near environment, (b) group processes among students, and (c) the assessment of practices within the classroom. She also saw using small groups as a means to: (a) increase the focus on teaching and learning by reducing the amount of teacher time spent on management, (b) shift more control from the teacher to students, and (c) heighten student motivation. Ultimately, she wanted to teach candidates to create a learning environment where democratic leadership prevails.

Among the strategies present during the 2-hour lesson, experiential learning was a prominent aspect of the instruction, in that it constituted approximately one-third of lesson time. Candidates experienced two small group teaching methods, and they experienced a way to report back to the whole class following one of the methods. Discussion was also a prominent part of instruction. The instructor asked many questions. Students gave responses or examples of concepts. In many instances, the instructor paraphrased students' responses. She also elaborated on students' comments and/or examples. Further, two prominent strategies associated with teaching concepts were used during the lesson. The instructor gave many examples, and spent about one-fifth of the lesson time using one of two cases. Finally, a prominent strategy was the instructor's explanations of concepts and relationships among them, using visual stimuli to illustrate concepts on the chalk board (see Table 1).

In terms of the knowledge that candidates constructed most from the lesson, their understandings focused on how to perform small group methods and various accompanying practices. Recall that each time candidates stopped the tape during stimulated recall interviews,

one of the three questions they answered was "What did you learn?" In using small group methods, for example, Patty learned "when you are dividing people into groups . . . you give them all the instructions first." Cathy stopped the video at the same point because she too learned "the importance of giving directions, and then dividing students up . . ." Later in the lesson Cathy also learned "how to apply a small group situation, how to bring it together and do the summation so you can make sure, see where the students are and help them make connections from all of the lists."

Likewise, in responding to the short answer assessment, the average score for candidates' responses on Question 4 was higher than for the other three questions. (Question 4 also focused on how to perform small group methods and various accompanying practices.) This question stated, "Name your favorite small group method of teaching and list some of its ground rules (tell how it is done)." Patty, for example, listed several ground rules for the method *huddle* including: "groups up to 5 in number; gather in groups with knees touching – all sitting down; everyone expresses themselves or takes a turn; small tight circle." In addition, the concepts that showed the most dramatic increases in frequency from pre- to post-prompted mapping may suggest that candidates were most focused on how to use small group methods or perform skills.

Evidence is also strong that candidates understood the rationale or reasons given by the instructor for learning various concepts. One idea candidates mentioned on the learning questionnaire was that by utilizing small groups, more of their time could be spent on actually teaching than on managing things and people. Wendy, for example, noted that having small groups of students "help manage a class . . . [can] prevent burnout and give the teacher more time to teach concepts and less time managing people and things." Similarly, Rose responded that

"small groups are a good way to involve students in managing classroom behavior. The classroom can progress more rapidly if students help the teacher with management. Also, the teacher is less stressed."

Candidates' responses on the learning questionnaire also suggested that the classroom is less teacher-centered when students are actively involved in classroom management. For instance, Teresa remarked, "Small groups are an effective way to involve the students and take the focus off the teacher." That students have more control over their own learning was also apparent in a response from Nan. She stated, "Small groups are a good way to get students actively learning, without feeling threatened or intimidated." Other candidates' responses contained one or more ideas concerning being student-centered, active participation, and the time a teacher spends on teaching versus managing people and things.

Further, comments made by Amy and Cathy during stimulated recall interviews also suggest that candidates understood the rationale or reasons given by the instructor for learning various concepts. Amy stated, "I guess what I learned from the whole thing was that small groups can manage efficiently, much better than trying to do it all yourself." Cathy also remarked:

> The activeness, using small groups . . . encourages kids to be active learners. It gives them an opportunity not just to be passive and just have things kind of march past them in a blur. It gives them a chance to interact and learn at the same time.

All data sources provided strong evidence that the instruction influenced candidates' learning. The correspondence between those concepts most and least-emphasized by the instructor and candidates was quite strong. Similarly, a strong connection existed between the concepts that received the most lesson time and those that candidates learned best. Further, the

qualitative analysis of concept maps revealed that candidates' use of target concepts increased (unprompted=59.12%; prompted=20.93%) and their use of idiosyncratic concepts decreased (unprompted=29.52%; prompted=82.41%). Finally, some of candidates' responses on assorted measures suggest that their knowledge of lesson concepts expanded and became better organized. Candidates knowledge generally appeared to become more interconnected and principle-based. That is, candidates understood that their use of small groups of students to manage the classroom would result in certain benefits.

Despite the evidence for the kinds of understandings candidates generally constructed, findings from all instruments suggest that some candidates learned more target concepts than did others. These findings are not surprising. Constructivist learning theories predict that some individuals will learn more than others by virtue of their prior knowledge.

On the postunprompted mapping task candidates use of target concepts ranged from 2 to 20 with the average being 8.88. Likewise, on the postprompted mapping task candidates use of target concepts ranged from 15 to 28 with the average being 23.56. Candidates' responses to the first question accompanying the postmapping revealed a similar pattern. The number of codes we applied to each response ranged from 1 to 10, with the average being 4. Further, the number of instances where each candidates' stimulated recall interview responses contained evidence of having learned target concepts ranged from 9 to 48, with an average of 32 instances. Finally, candidates' learning varied on the short answer assessment. That is, 70% of participants' responses were rated with a score of 4 or 5, and 30% of their responses were rated with a score between 1 and 3.

Conclusion

Findings regarding what candidates learned are encouraging because they seemed concerned with both procedural and declarative knowledge. Gitlin, Barlow, Burbank, Kauchak, and Stevens (1999), for example, found that candidates were more concerned with the mechanics of knowing how to teach, but were relatively less concerned with understanding theoretical or conceptual knowledge. Such findings are cause for great concern given that theories of skill learning emphasize the importance of declarative knowledge in the development of procedural knowledge (Anderson, 1993). One implication of the present study is that teacher educators must do a better job of helping candidates connect declarative and procedural knowledge, so that they understand not only the how but the why of teaching.

The present study enabled us to document the connections between the instruction and candidates' learning (See Jensen, 2001 for a complete discussion of the strategies that candidates found salient and the reasons they gave as to why these strategies aided their learning.) Findings from both stimulated recall interviews and the learning questionnaire suggest that candidates' knowledge construction was greatly influenced by a story or case about which candidates had much prior knowledge. That the case aided candidates' learning because it was intelligible makes sense due to their prior knowledge. Further, experiential learning was an important influence in learning because candidates were active participants in constructing meaning with their peers and with the instructor. Multiple opportunities for elaboration on the social plane, also important in candidates' learning, occurred through discussion, instructor explanations, and instructor examples. Candidates' consistent mention of multiple modes of representation as a reason for having learned is also noteworthy. Finally, the findings suggest that the instructional approach

enabled the instructor to access and address students' concerns or central goals.

Recommendations for Further Study

This study is a beginning point for expanding constructivist learning theory to its application for teaching. To construct a theory of learning environments for teacher candidates, many more studies are needed that examine what candidates learn in various learning environments. The need for validated instructional approaches that are grounded in theory has never been more acute within teacher education. Until we can construct useful models of preservice teacher learning, we are at great risk within the academy because our work as teacher educators is not grounded in theory. In addition, as students in FCS education graduate and begin to teach junior high and/or high school, their instructional abilities will largely determine how well they fulfill their professional mission of empowering individuals and strengthening family life.

Teacher educators most often use a combination of strategies with teacher candidates. In order to confirm and extend the findings from the current study, more descriptive studies are needed that examine the kinds of knowledge that candidates construct when varying combinations of strategies are employed. The methodology of these studies needs to enable researchers to validly attribute candidates' learning with particular strategies. Recall that researchers make largely unsupported claims concerning the efficacy of an enormous number of instructional approaches. When we have more knowledge concerning candidates' learning in various learning environments, it will be important to match this information with the kinds of understandings that we want candidates to develop.

Due to the limitations of the present study, we do not know if the strategies used by the instructor will similarly influence the learning of other candidates in FCS, teacher candidates

generally, or all students. We also do not know whether instructional strategies influence candidates similarly, given differing kinds of concepts within the knowledge base or within other subject areas. Further, we do not know if candidates will utilize their learning in the classroom. More research in diverse subject areas, with diverse learners, and over extended periods of time is needed.

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Table 1

An Estimate of the Instructional Strategies Used during the Lesson

Codes	Frequency	Total Frequency
Teacher questioning/student responses		74
1. Instructor asked a question and student(s) provided a response	59	
2. Student(s) responded with an example(s) of a concept in response to a question posed by the instructor	14	
3. Instructor refocused candidates' attention based on a student's example in response to the instructor's question	1	
Instructor Explanations		55
1. Instructor elaborated on students' comments and/or examples	34	
2. Instructor explained concepts and relationships among them	10	
3. Instructor gave a rationale for learning lesson concepts	5	
4. Instructor explained a strategy or syntax for a method in whole or in part	3	
5. Instructor connected candidates' prior knowledge with new information at the beginning of the lesson (established set)	2	

Table 1 Continued

Codes	Frequency	Total Frequency
6. Instructor used a mnemonic device	1	
Focusing Attention		46
1. Instructor paraphrases responses	37	
2. Instructor used a transition	3	
3. Instructor focused candidates' attention by telling them an idea was important	2	
4. The instructor had a candidate read two sentences twice in the case	2	
5. Instructor focused candidates' attention on the major character in the case by telling a humorous personal story about how she came to like him	1	
6. Instructor had candidates circle an idea in their notes	1	
Teaching Concepts		37
1. Instructor gave an example	27	
2. Instructor made reference to a case described earlier in the lesson	6	
3. Instructor used a case	3	
4. Students experienced a negative examplar and the instructor focused their attention on it	1	

Table 1 Continued

Codes	Frequency	Total Frequency
Visual Stimuli		19
1. Instructor wrote concepts on the chalk board	13	
2. One or more transparencies containing a matrix that succinctly organized information	3	
3. Instructor modeled a strategy	2	
4. A handout was distributed by the instructor	1	
Experiential Learning		3
1. Candidates experienced a small group teaching method	2	
2. Students experienced a way to report back	1	

Note. Frequency counts are not always a good indicator of the amount of time the instructor spent using various strategies. To generate this table, the narrative description, a condensed representation of the video transcript, was coded. When in doubt about the exact number of times a strategy was used, the video transcript was consulted.

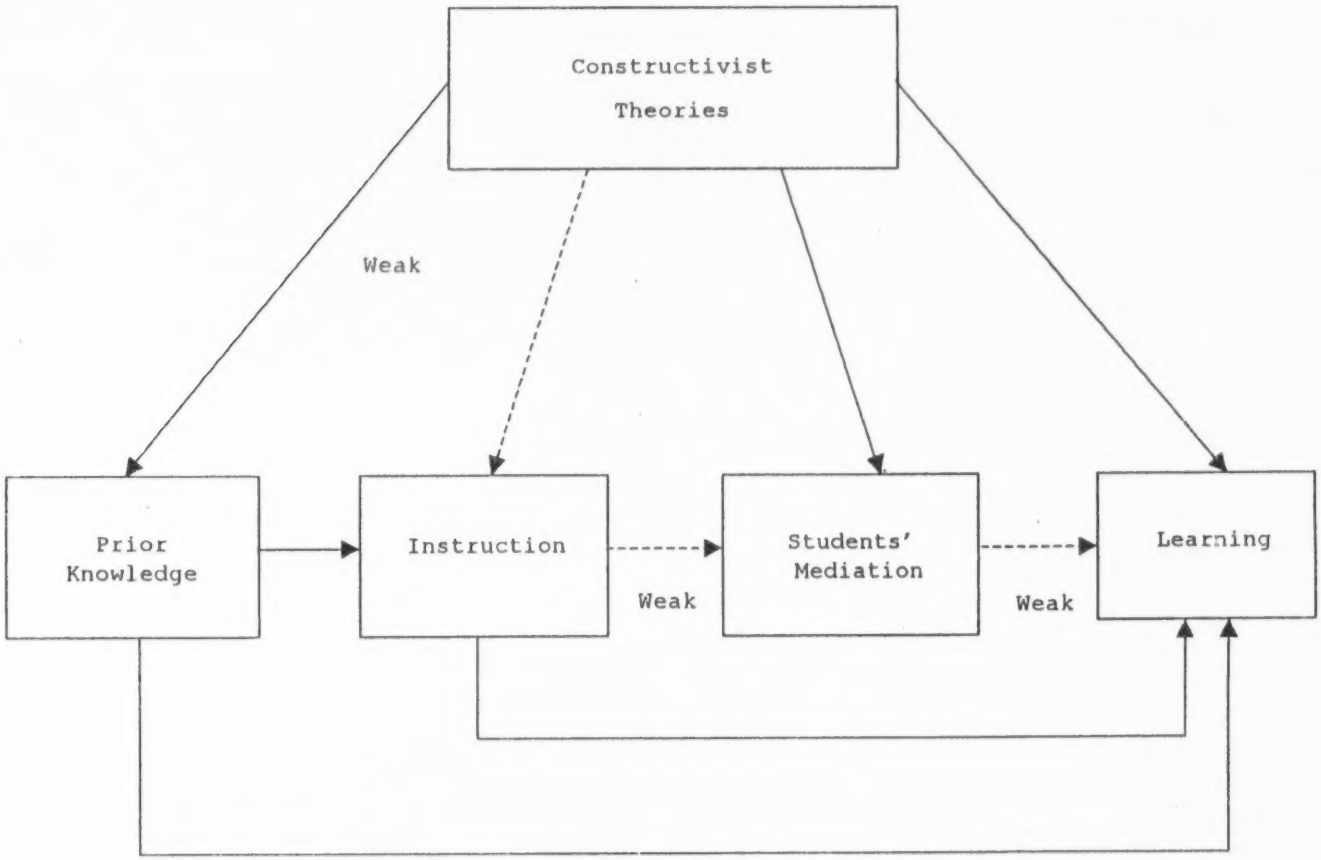

Figure 1. Empirical teacher education literature.

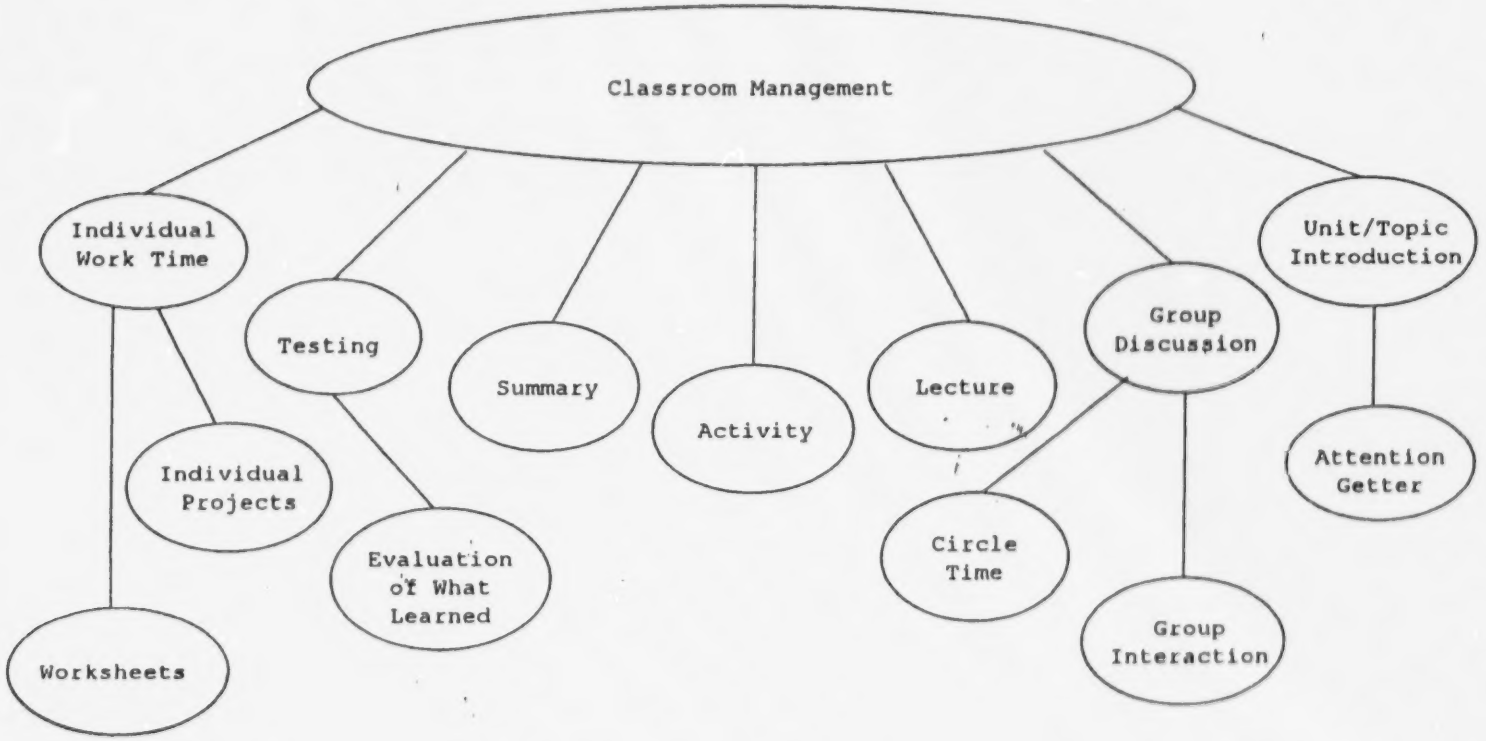

Figure 2. A candidate's preunprompted concept map.

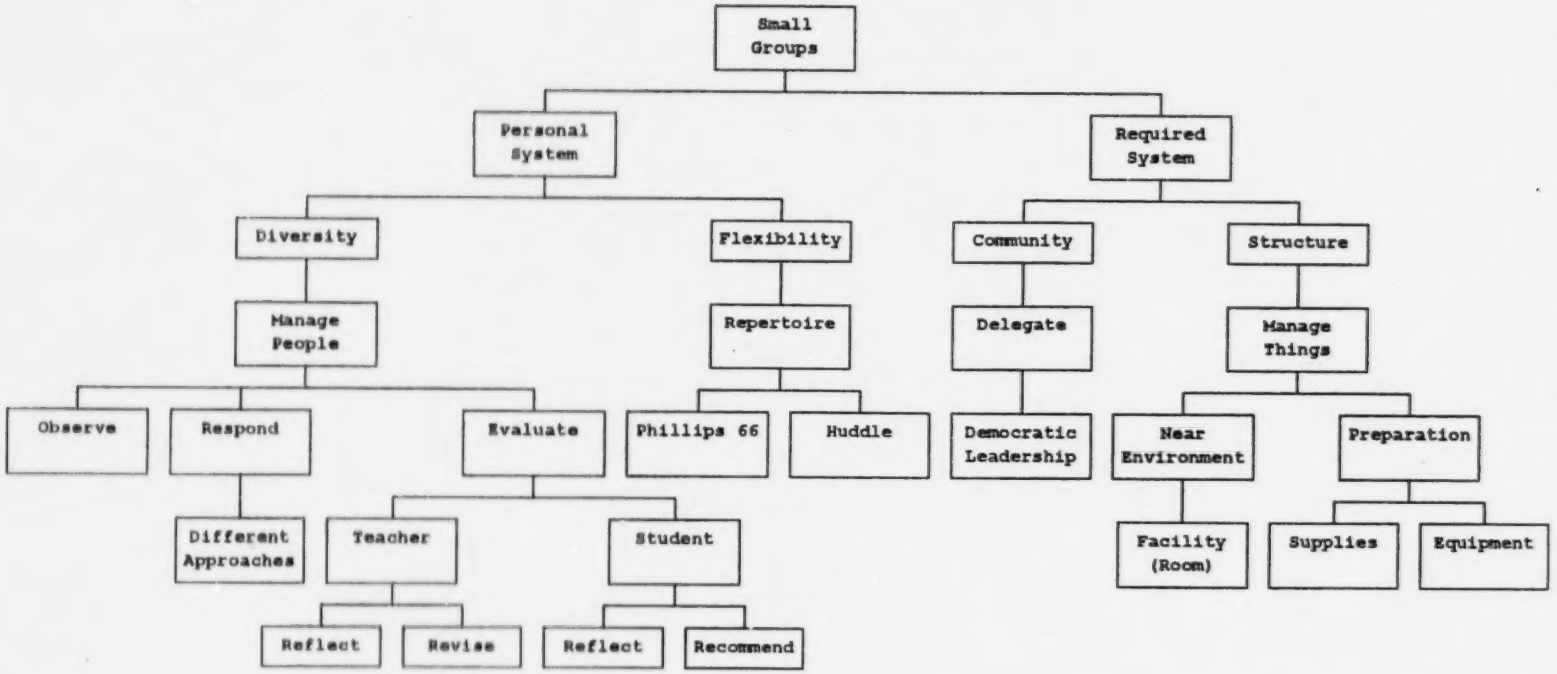

Figure 3. The instructor's concept map.

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CLEARINGHOUSE ON TEACHING
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November 1, 2001

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Sincerely,

Linda M. Kelly
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